Method for Fixing the Position of a Tab Having an Anti-Rotation Bead Formed From the Panel of a Sheet Metal Lid (Steep Anti Rotation Device)

The invention relates to a further improvement or further provision of a positional fixing of a tab on a sheet metal lid according to the simultaneously filed (co-pending) PCT application, originating from the same inventors and the same legal successors, the disclosure of said application being included herein. The file number of the co-pending PCT application is PCT/DE03/... of December 23, 2003.

When the tab is in an attached condition to the sheet metal lid, it is known by the expert as a SOT (Stay on Tab), which is provided for opening an openable area in the surface of a lid (usually designated as "panel"). For this purpose, the tab is taken at a grip end and raised with a vertically orientated tilting motion for breaking open an openable area along a line of weakness (usually called score line) with its opening end.

Particularly with large opening ends (LOE) as openable area, difficulties are encountered in the related art with regard to fixing the positions of the tab in an attached condition to the sheet metal lid. Suggestions on this topic have already been made, for example in **US 5,799,816** (Schubert). In said document, an opening of an attaching portion of the tab is proposed, which attaching portion is usually designated as "rivet island". Said attaching portion is secured to the panel of the sheet metal lid through a shaped rivet and overlaps a round to elongated reformed bead with an opening provided in the attaching portion, which bead may also be formed after attaching the tab, compare column 3, lines 63-67, column 5, lines 37-44, claim 3 of said document and the associated graphical illustration in figures 2 and 4 thereof.

The invention addresses **the technical problem** of achieving such effect, but with an improved manufacture and reliability of the anti-rotation block and with an improved positional alignment of the tab in the attached condition. For this purpose, a method is proposed.

Advantageously, an already present peripheral edge on a usual tab is used, said edge not having to be specifically formed additionally for obtaining the rotation barrier after an attachment of the tab to the panel ("staking"). The only influencing takes place on the sheet metal lid itself, which is provided with a shape or molding, as the rivet is in a

preliminary phase, which shape or molding may preferably also be pre-formed in parallel together with the formation of the rivet and subsequently be modified in shape, or more precisely "reformed", in a further processing step of the sheet metal lid being manufactured (claim 1). The projection can thus be formed integrally with the sheet metal lid, as the securing point is formed by one-piece manufacturing for the attaching portion of the tab.

The projection does not protrude through an opening of the attaching portion, and the attaching portion is not provided with an opening beforehand, but the attaching portion remains entire, and a blocking means that acts on the attaching portion from outside is provided, see co-pending PCT application, which is included herein).

Forming at least one projection to have an asymmetrical cross section is particularly advantageous, said projection having a steeper flank facing the attaching portion, than the flank facing away from said attaching portion (claims 17, 18, 19 and 23 or 24 of the co-pending PCT application). Such a shape can also be selected for punctiform or oval projections.

In a subsequent reshaping, reforming, or post-forming, preferably the thickness of a top side of the (strip-shaped) projection is reduced (claim 3 or 4). Thereby, a solidification of said portion and of the projection as a whole is achieved. This also applies to the method. The score line can be introduced not simultaneously with said reforming, in temporally shifted or offset processing steps. The same is valid for the pre-forming of the bead, which is not shaped at the same time, as the score line is inserted (claim 1).

In order to obtain the blocking effect, which can also be a limiting effect, which is to be understood to range from a complete prevention of a rotating movement up to a substantial limitation of said rotating movement, an outer edge of the flat attaching portion (rivet island) is stopped by abutting against the projection that is shaped to protrude out of the sheet metal lid.

The projection can have strip shape (line shape) and be preferably orientated one of transversely and in parallel to a longitudinal extension of the tab (longitudinal axis or longitudinal plane), said projection engaging at a correspondingly orientated peripheral edge of the attaching portion for its blocking effect or being provided very closely adjacent thereto. In a longitudinal extension, said projection can extend over more than 30 %, preferably over more than 50 % to more than 80 % of the width of the attaching portion (claims 5, 36).

Several projections can be provided, not all projections having to be associated with the same outer edge portion of the attaching portion. The projections can also be differently shaped, i.e. strip-shaped, round to oval, or a combination thereof. If a straight-lined outer edge portion of the attaching portion is provided, a straight-lined (strip-shaped) design of the projections can be advantageous. Said straight-lined or linear strip design can also be achieved by arranging at least two punctiform projections in line, which then form a group that is associated with the same outer edge portion of the attaching portion.

When several projections are provided in the aforementioned sense, they do not have to engage at the same edge line of the attaching portion when starting a rotating movement, but instead they can be assigned to different outer edges (claim 16).

When providing a strip-shaped projection, it can be designed to have a length longer than the diameter of the finished rivet head.

The attaching portion being formed from a piece of the central portion of the tab, only minor gaps are visible between the attaching portion, which is displaced downwards to a lower plane by a double buckling line, and the somewhat higher, parallel plane of the rest of the remaining tab. Accordingly, the mounting of the projections on at least one of the free peripheral edges facing outward from the attaching portion is barely or only hardly visible from the outside, so that the rotation blocking is virtually invisible to the observer. A colored tab is not changed further in its colored appearance.

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Exemplary embodiments explain and supplement the invention. Reference is made to the content of the disclosure of the co-pending PCT application (as mentioned in the introductory part).

Figure 1a,
Figure 2a,
Figure 3a show three stages in a manufacturing process of a sheet metal lid, comprising a station for inserting a weakening line 16, a station for introducing a finger depression 13 and additional beads 18a in the openable area inside the weakening line, and a first station at which a pre-form 20* of a bead 20 is shaped, achieving a blockage of the rotational behavior of a tab 30.

Figure 3
Figure 4 of the parallel PCT application, the complete content of which is made reference to, shows a further, subsequent manufacturing station, at which a tab 30 is mounted over a rivet 11 integrally formed on the sheet metal lid, via an attaching portion 31, which as a flat attachment tongue (rivet island) serves for mounting ("staking").

The sheet metal lid obtained according to a method as shown in **figures 1a to 3a** has a visible edge portion 12 as a seamable edge that is suitable for seaming to a body of a beverage can. The sheet metal lid itself is produced from thin sheet metal, typically less than 0.24 mm, and has already passed through preceding workstations before reaching the stage shown in figure 1a. Said lid comprises an inner surface portion (panel) 10 surrounded by a seamable edge 12. Within said panel 10, a weakening line 16 is to be inserted around an openable area, said openable area being surrounded by a substantially U-shaped bead 18. Within said bead, which opens in the centre portion of the panel, a substantially oval weakening line 16 is to be designed as a score line having a transitional section that is not scored and thus serves as a connecting portion to the rest of panel 10 when said openable area 17 is broken in along said score line 16 by the effect of a tab, which will be explained later. This is illustrated in figure 2a.

A mounting place 11, which is visible more clearly in the sectional enlargements of the co-pending PCT application, is provided approximately in the middle of the panel. An attaching portion 31 as a sheet metal tongue is schematically associated therewith, said attaching portion being part of the tab according to **figure 3**, on which it is formed integrally via an articulation line as a buckling line 38. Said tab 30 comprises a grip

portion 32, provided here with a circular opening, at which the tab is operated by the user for breaking open said score line 16 according to figure 2a. Said tab 30 also comprises an opening nose portion 33 before said attaching portion 31, said opening portion being located as a break-in nose above said openable area 17, for which purpose an additional, eyeball-shaped bead 18a as shown in **figure 2a** is provided in a separate working step, said bead reinforcing the transverse LOE openable area, for being able to apply the opening forces to the break-open starting portion (loop-shaped end of the score line 16). The mounted tab 30 is substantially parallel to the panel, which itself does not have to be designed exactly in one plane, but may be slightly bulged, though the area around said mounting place 11 is substantially planar, allowing a substantially parallel arrangement of the attaching tongue 31 of said tab 30.

According to the **figures**, at least one, preferably three strip-shaped projections 20 are re-formed around said mounting place 11 as upwardly protruding beads (i.e. towards the outside of the sheet metal lid). A bead 20, extending transversely to a midplane 100, is longer than the two neighboring beads, which extend parallel to said midplane 100. They are illustrated for clarification purposes by 21a, 21b in **figures 3 and 4** of the co-pending PCT application, as also the longer bead 20 is represented in more detail there with respect to the attaching tongue 31.

At one manufacturing station, the re-forming of the three beads 20 (or also 21a, 21b) is improved or designed more exactly. Said "re-forming" results in a formation of the beads (projections) as used later for the positional fixing according to figure 3 and the remaining figures of the co-pending PCT application. At said station, the at least one projection receives its correct profile geometry, after having been re-formed integrally from the sheet metal lid (the panel) according to figure 1a.

A re-forming step comprises a designing shaping of the pre-form 20* with a coining (an embossing operation) for further flattening the top surface 20c. In said re-forming process, the tool is applied likewise from the top and from the bottom for said re-forming. The slight bend according to figure 8a that is detectable on the left in the rising flank of the pre-form 20* can be recognized in the lower final form, the way in which the sharp front edge 20" is inserted in the initially gently rising left incline of the shaped rampart 20* also being visible. To the right of the transverse plane 101, the second incline of the rampart is shaped from bottom to top, for forming a flat top side 20c starting substantially at the instep of said rampart 20*, said top side, in a portion 20b, leading gently over to the rest of the sheet metal panel 10.

Additionally, in the final form, the attaching portion 31, which is mounted at the rivet 11, and also the tab 30 are already attached according to figure 3, also in a sectional view. The tab is arranged with its intermediate web between the left opening and the grip opening 32b, substantially above a transversely extending projection 20. Said two openings of the tab are shown in figure 3, one opening being realized by the formation of the attaching portion 31, which is further connected to the tab 30 via an articulation line 38, whereas the opening for inserting a finger is designed particularly. Said opening 32b forms part of the grip portion 32, the web 32a between said two openings being shown slightly bulged in figure 8a, having a front edge 32c that was related to the free edge 31c of the attaching portion 31 during manufacture. A major part of the projection 20 is thus located below said web and is barely visible from outside.

In this context of the two-stage re-forming, a modified sequence can be used besides the processing sequence according to figures 1 to 3 of the co-pending PCT application, for example an initial introduction of the at least one pre-form, as explained by the pre-form 20* in the top picture of figure 8a, in a first working step, still without the introduction of score lines (as weakening lines), of which weakening line 16 is an example. For a projection 20 with a related pre-form 20*, this is illustrated by the sequence of figures 1a, 2a, 3a; the subsequent assembly can be identical to that illustrated in figure 3 of the co-pending application.

If multiple projections are used for blocking rotating movements of the tab – all pre-forms 20* are shaped according to figure 1a. In said figure, only one projection is illustrated. The first score line is inserted only later, in a separate working step, e. g. after re-forming (further shaping) of the pre-shaped projection 20*. Here, the one projection receives its correct, assigned profile, as is shown in the bottom illustration of figure 8a of the co-pending PCT application. In this way, it can be achieved that a scoring operation, subjecting the sheet metal to severe stresses, is not performed at the same time as the shaping of the pre-form takes place in said first working step, said shaping considerably stressing the sheet metal lid. The score line may be inserted prior to or after the re-forming operation which also stresses the sheet metal. During re-forming – as shown in figure 8a – the wall thickness on the top side of the projection is reduced by about 10 % to 15 %, with a simultaneously occurring compression and solidification of said portion, which is achieved by the embossing operation (coining) uniformly from the top and from the bottom.